# REPORT DOCUMENTATION PAGE

*Form Approved*
*OMB No. 0704-0188*



| 1. AGENCY USE ONLY *(Leave blank)* | 2. REPORT DATE | 3. REPORT TYPE AND DATES COVERED |
|---|---|---|
| | December 2002 | Final Technical Report 14 Nov 2002-14 Feb 2003 |

**4. TITLE AND SUBTITLE**
A QUALITATIVE ASSESSMENT OF SCORPION INTEGRATED PROTECTION ANALYSIS (IPA) PHASE 1 CONCEPTS BY MILITARY PERSONNEL (USER JURY)

**5. FUNDING NUMBERS**
9398-EE-07
N62558-03-M-0003

**6. AUTHOR(S)**
Dr. David Marshall

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**
Suite 330
44-46 Morningside Road
Edinburgh, Scotland EH10
United Kingdom

**8. PERFORMING ORGANIZATION REPORT NUMBER**

**9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)**
US Army - European Research Office
Edison House
223 Old Marylebone Road
London NW1 5TH
United Kingdom

**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**

**11. SUPPLEMENTARY NOTES**

**12a. DISTRIBUTION / AVAILABILITY STATEMENT**
APPROVED FOR PUBLIC RELEASE - DISTRIBUTION UNLIMITED

**12b. DISTRIBUTION CODE**

**13. ABSTRACT** *(Maximum 200 words)*

The aim of this research was to provide a qualitative assessment of Scorpion Integrated Protection Analysis (IPA) Phase 1 Concepts. The evaluation was undertaken using Military Personnel (User Jury). Data was collected using focus group methods on positive and negative aspects of five delivered neck down combat uniform concepts, and three headgear concepts. The results showed a positive response to the idea of a specific combat uniform. One concept was positively received by the User Jury and key features were identified across all of the concepts for future development. Issues relating to military culture, suggestions for improvements, key user benefits and implications on military personnel of IPA implementation and potential challenges from the user perspective are reported.



| 14. SUBJECT TERMS | 15. NUMBER OF PAGES |
|---|---|
| Scorpion, Integrated Protection Analysis (IPA), Objective Force Warrior (OFW), User acceptability, User Jury, Combat uniform, Headgear, Performance, Military culture | 39 |
| | 16. PRICE CODE |

| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION OF THIS PAGE | 19. SECURITY CLASSIFICATION OF ABSTRACT | 20. LIMITATION OF ABSTRACT |
|---|---|---|---|
| UNCLASSIFIED | UNCLASSIFIED | UNCLASSIFIED | |

AD



# A Qualitative Assessment of Scorpion Integrated Protection Analysis (IPA) Phase 1 Concepts by Military Personnel (User Jury)

Final Technical Report
by

Dr. D. Marshall
(December 2002)

United States Army

EUROPEAN RESEARCH OFFICE OF THE U.S. ARMY

London, England

CONTRACT NUMBER N62558-03-M-0003

Dr. D MARSHALL

Abstract:

The aim of this research was to provide a qualitative assessment of Scorpion Integrated Protection Analysis (IPA) Phase 1 Concepts. The evaluation was undertaken using Military Personnel (User Jury). Data was collected using focus group methods on positive and negative aspects of five delivered neck down combat uniform concepts, and three headgear concepts. The results showed a positive response to the idea of a specific combat uniform. One concept was very positively received by the User Jury and key features were identified across all of the concepts for further development. Issues relating to military culture, suggestions for improvements, key user benefits and implications on military personnel of IPA implementation and potential challenges from the user perspective are reported.

Key words:

Scorpion

Integrated Protection Analysis (IPA)

Objective Force Warrior (OFW)

User acceptability

User Jury

Combat uniform

Headgear

Performance

Military culture

Contract order number N62558-03-M-0003

David Marshall Suite 330

44-46 Morningside Road

Edinburgh

Scotland

EH10 5BF

Acknowledgements: The research reported herein has been sponsored in part by the United States Army through it's European Research Office. Thanks are extended to Dr. R. Bell, J. Johnston and A. DiChiara of Natick Soldier Systems for their valuable comment and contribution to this research.

Any opinions findings and conclusions and recommendations expressed in the material are those of the author and do not necessarily reflect the views of the European Research office of the US Army.

*Please note that the Services are provided by David Marshall acting in a private capacity. David Marshall is not, and shall not be deemed to be, acting as an agent of, or representing in any way, The University of Edinburgh. Accordingly, the University takes no responsibility for the Services or for the manner in which they shall be carried out, and shall incur no liability whatsoever for any injury or loss or damage arising therefrom.*

## Executive summary

- Four focus groups were conducted with a User Jury (UJ) comprising experienced active duty military personnel and enlisted personnel representing a cross section of MOS. The UJ was established to assist in the evaluation of several concept combat uniforms as part of the Scorpion Phase 1 Integrated Protection Analysis (IPA).

- The UJ felt that uniform designed specifically for combat engagement was an excellent idea.

- Any new combat uniform should be made available to every soldier across the Army. It should be kept simple and made 'Joe' proof.

- Functionality is paramount with the key objective to improve the soldier's performance.

- Appearance and image are also important considerations. The new combat uniform should intimidate the enemy and look good.

- Soldiers will have to be trained in how to use and maintain the new combat uniform

- The overall preference was for the Crye concept(s). In the focus groups specific mention was made of

    - The protection, comfort, integrated cooling system and increased load carrying capacity of the Crye stand-off chassis offering protection,

    - The fit and wicking capabilities of the garment component of the combat uniform

    - The unique camouflage pattern and intimidating appearance of the combat uniform

    - The redesigned ammunition delivery system – 'magmag'- and disposable magazines

    - The quick don/doff time for the chem/bio system and the innovative waste management design

    - There were some questions over the maintenance and repair of the stand-off chassis

- The UJ identified a number of positive design features in the ADL concepts that might be developed and integrated into the next stages of the programme

- The integrated soldier monitoring system (concept C)
- The carapace weight distribution system (concept C)
- Water filtration system (concept C)
- Flat batteries (concept C)
- Cooling vets and hand and leg warmers (concept C)
- Body armour, body belt (concept B)
- One piece uniform (concept A)

- The UJ expressed an overall preference for the R2 helmet. (The R1 offered little advantage over the Mich, and the R3 was seen as too '*blue skies*').
- Helmet development should address the primary need for lighter helmets combined with better ballistic protection
- The UJ liked the integration of ancillary equipment into the body of the helmets (R1 and R2) and the built in modularity of the design allowing elements to be configured for each mission, or MOS.
- The information management systems were very positively received by the UJ, especially the 3D audio feature
- The UJ suggested a number of areas where the helmet design could be improved. These included suggestions about refinements to the earpieces, chin straps, neck protection and visors
- Further work is required on the design and fit of the chem../bio mandible attachments for the R1 and R2 but the concept is basically sound.
- Soldiers will require training in how to use these 'hi tech' helmets
- Phase II Scorpion IPA program needs to address the helmet - neck down interface and develop both systems in tandem.
- The UJ anticipates some opposition to the introduction of a new combat uniform, notably from Sergeant Majors and Majors with more 'conservative' views, but the combat uniform concepts have potential to improve soldier performance and are likely to appeal to new recruits.
- The consultation with users at such an early stage of product development was regarded as very positive by the UJ, who welcomed the opportunity to provide comment and input to the designs.

# CHAPTER 1: INTRODUCTION

This report forms part of the Phase 1 evaluation of the Scorpion Integration Protection Analysis (IPA) program. The program objectives are to demonstrate the feasibility of a revolutionary, combat-specific, integration/protection ensemble for the objective force warrior (OFW), to leverage new and emerging technologies and to design system concepts that provide advances in survivability, mobility, and war fighter performance.

The objective of the Phase I evaluation was to provide a balanced broad ranging evaluation of the Scorpion IPA system concepts by military personnel (User Jury), government subject matter experts and Scorpion IPA program personnel. The qualitative focus groups formed part of this evaluation and were designed to elicit User Jury response, critical comment and evaluation of mock-up IPA systems as part of the overall assessment in Phase 1. Follow up brain storming sessions will be used to develop marketing communication strategies for introducing the Scorpion system to military personnel. Several of the concepts are shown in the appendices; however, due to the propriety nature of the research it has not been possible to show all of the concept uniforms.

The neck-down and headgear aspects of Scorpion were designed separately, with one contractor (Exponent) creating headgear concepts, and two different contractors (ADL, now known as TIAX, but for this report they will be referred to as ADL, and Crye Associates) creating neck-down concepts. Between 16 May and 30 May 2002, Scorpion IPA neck-down concepts were delivered from both ADL and Crye Associates, and headgear concepts were delivered from Exponent. Again, due to the propriety nature of the research it has not been possible to show images of the concept headgear.

The goal of exercise was: 1) to provide qualitative data that would contribute to the decision as to which contractor (or combination of contractors) would move forward with Phase II of the Scorpion program; and 2) to learn about the positive and negative aspects of the delivered concepts and selectively utilize and integrate appropriate aspects in order to maximize the likelihood of the success of Scorpion IPA and OFW during the next phases of development.

The report examines the reactions of the User Jury to these concepts and reports on

1. Overall impressions of the IPA concepts presented in Phase 1 and discussion of how this 'fits' with existing military culture and current designs
2. General preferences and discussion on the merits and drawbacks of the IPA concepts from the user perspective
3. Suggestions for improvements and refinements to the IPA concepts as presented
4. The potential challenges regarding user acceptability and appropriateness
5. Key user benefits and implications on military personnel of IPA implementation

## CHAPTER 2: RESEARCH METHODS

The primary research technique used was the semi-structured focus, or discussion group, method. This normally involves recruiting a group of eight to twelve people to take part in a discussion, however in this case the assembled User Jury served as the discussion group. All discussions were moderated by an experienced qualitative researcher, working from a pre-determined interview schedule approved by members of the Scorpion management team. The focus groups were semi-structured in their design to ensure that user views and opinions about the key research issues were discussed, but there was sufficient flexibility built into the groups to identify those issues that the soldiers considered important. The focus group provides an ideal environment in which to collect a range of perspectives, and the moderator uses the synergy of each group to explore the issues and seek a consensus of opinion among participants.

Focus groups were conducted with a User Jury (UJ) comprising experienced active duty military personnel and enlisted personnel representing a cross section of functional areas. The User Jury (UJ) comprised of 16 experienced soldiers from the 101st at Ft. Campbell, from the Land Warrior Office at Fort Benning (both these groups evaluated the ADL concepts and the Exponent Headgear concepts), and from the JRTC at Ft. Polk (this group evaluated the Crye concepts and the Exponent Headgear concepts). Members, representing infantry, MPs, medics, aviation transport, mechanized infantry, and engineers were all male and they ranged in rank from staff sergeant to Captain and Warrant Officer. The average age was 33.6 years (range 21-45 years), average length of service was 15.2 years (2-15 years), and 15 of the 16 members had been deployed within the past three years.

User Jury evaluations took place on May 16 and 17 for ADL and Exponent headgear (by the eight 101st users), and on May 20 and 21 for Crye and Exponent headgear (by the eight JRTC users). The focus groups were conducted after contractors had presented all of their concepts and the User Jury had completed the questionnaires on overall acceptance, ratings of how well each concept was expected to perform on certain critical needs of the Scorpion project, and how well each concept was expected to perform on certain aspects compared to current equipment. Each User Jury discussed the neck down concepts and the headgear concepts separately. Focus groups lasted on average 90 minutes and were conducted with members of the Scorpion Management team, contractors and User representatives present. All of the focus groups were conducted on site at Natick Soldier Systems, Natick, Mass.

# CHAPTER 3: FINDINGS

## 3.1 IPA concepts and fit with military culture

One of the main objectives was to examine the User Jury response to each of the concepts presented by the appointed contractors, Crye and ADL, and to determine their fit with military culture. Gaining acceptability from the user is seen as a key element in the IPA system and the focus groups were used to explore the User Jury reactions and solicit views on how these combat uniform concepts would be received in the military. There were a number of key issues that emerged from this general discussion on military culture these are listed below

- **Functionality** is of major importance and the design and introduction of a new combat uniform has to demonstrably improve soldier **performance**, and genuinely enhance soldier capabilities. This is the primary concern for the soldier(s) and MOS have different requirements and constraints. For example, truck drivers and pilots are constrained in terms of the interior architecture of their vehicles and aircraft and this has to be taken into account in designing the combat uniform. Existing platforms would require some adaptation to accommodate the combat uniform. Alternatively new platforms could be designed around the IPA system.

- Military culture places a lot of importance on **appearance and image** and this is likely to remain significant but ultimately the uniform concepts have to prove themselves in the field of combat, reiterating the role of performance and functionality. However, uniform appearance remains an important part of military culture and very few of the UJ felt that there would be a significant change in emphasis on this aspect of military life. There is a constant trade off between functionality and looking good, for example, one aviator discussed the negative effect on flame retardant qualities of the ABDU from constant dry cleaning and pressing in order to ensure standards were met on appearance. The acceptance of the new combat uniform assumes a cultural shift on this issue. In the field, or in combat, the intimidation factor is a key element in the uniform and regarded as an integral part of the new uniform. The initial impression created by the uniform is extremely important in this respect. To quote one of the UJ

> ***You've got those guys out there on the line and they're dressed for success and they look ready, I don't give a damn what anybody says. It's going to turn somebody's head. They're going to think twice before they're going to charge that line. And as long as this stuff works like it's supposed to work and everything, and you can look intimidating doing it, than you've got a psychological advantage already.***
>
> ***User Jury: Crye concepts***

- The introduction of a new combat uniform will require soldier **training** in how to efficiently and effectively deploy the uniform in the field. In addition some of the new design features in the concept uniform, for example, the use of a body armour chassis and the introduction of new technology for physiological monitoring, represents a major departure from existing uniforms and will require regular checking and **maintenance**. There was some question over who would be responsible for the **upkeep** of the uniform. One UJ felt that Joe should be responsible for the uniform but much depends the complexity of the final design and which concept is approved. Under the existing system soldiers are responsible for their own uniform maintenance and upkeep, but the introduction of a new combat specific uniform raises issues about ownership, who would be issued with the new uniform and who would be responsible for the upkeep and maintenance of the uniform. Much depends on whether the combat uniforms are issued to all soldiers or simply part of the deployment with the specific mission.

- The general feeling among the UJ was that eventually all soldiers should be issued with the new uniform. However, much depends on which concept is approved for Phase II, for example ADL Concept C with the hydraulic chassis system, was seen as more appropriate for certain missions and special forces rather that something that would be issued to all soldiers.

### 3.1.1 Combat uniform concept

Specific discussion about the idea of developing a specific uniform for combat, as opposed to non-combat situations, revealed a number of suggestions about how the concept should be developed in light of the User Jury experience in the field and exposure to the IPA concepts. The UJ stressed the importance of beginning with the user and developing a combat uniform around the soldier, as the following quote shows

> ***'let's get real we need uniform and a choice of equipment not a piece of equipment that we want to call a uniform and I think that's what we need to think about, I mean all this stuff looks great...my job is to make sure Joe don't get stuck with all this shit'***
>
> ***User Jury: ADL concepts***

The UJ felt that a **combat specific uniform** was an **excellent idea**. Combat uniforms should be designed specifically for the task and be able to accommodate the needs of different MOS and different combat environments. The move away from the existing multipurpose battle dress uniform was seen as a positive transition making a clear distinction between attire for the field and garrison where there are different uniform requirements.

In the field the key concerns are related to **mobility** and **weight** and there was a general feeling that these issues need to be addressed within the design of a new combat uniform. These factors are directly related to soldier **comfort** and **performance** during the mission. Ideally the combat uniform should be kept as **simple** as possible to avoid any

unnecessary complications that demand undue additional training for the soldiers in use and maintenance of the equipment. Overly sophisticated equipment, or unnecessary features should be avoided. Infantry soldiers want to minimise the weight they carry and will jettison any non-essential items for the mission. Airborne soldiers need to avoid excess equipment and consider the suitability of the combat uniform in a 'jump situation'. As well as accommodating different MOS requirements, individual missions often have different uniform requirements, for example, including or excluding chem./bio options depending on the level of the threat. There should be the capability to adapt the uniform to suit the mission and advanced information can prove vital in determining which uniform system to deploy and what equipment is essential to the mission. While this adaptability is important the new combat uniform also needs to be '**JOE proof**' as the individual soldier will further adapt, modify and change the system to meet their individual needs and those of the mission. The UJ felt that ultimately **every soldier** should have a combat specific uniform, as all soldiers need protection.

## 3.2 User Jury perspective on IPA neck down concepts

The User Jury comprised two groups of eight military personnel; each group saw and evaluated one set of concepts. This section of the report looks at the evaluation of the Crye concepts, A (3.2.1) and B (3.2.2) by one half of the UJ, followed by the ADL concepts, A (3.2.3), B (3.2.4) and C (3.2.5) evaluated by the other half of the UJ. In both cases the contractors presented the concepts to the UJ and members of the jury were permitted to ask questions, examine, and where possible try on the mock up uniform concepts. All of the uniforms were initially modelled by a soldier who was available to answer questions about fit, comfort, ease of donning and doffing the uniform or any other questions posed by the UJ.

### 3.2.1 Crye concept A

***- 'It's bad enough when a couple of guys in green suits jump out with guns, start shooting at them and they start running. You couldn't imagine if you jumped out looking like a storm trooper, and [running after them]. [laughter] It really does.***

***- Oh, yes.***

***- When a guy had that stuff on, first of all, it made him look twice as big, you know. And that's a big advantage. A lot of people, a lot of foreigners look at Americans already that they're bigger than they are. Now double their size and make them look like a bad, you know, a real bad-ass, and you've got a little psychological advantage over them'.***

***User Jury: Crye concepts***

Concept A was presented to the UJ and formed the main basis of the Crye combat uniform concept. It comprised a main chassis that provided ballistic protection and carrying capacity for ammunition and a ruck. (see Appendix 1). The UJ made the following observations.

- This combat uniform concept is primarily designed for the infantryman with adaptations/refinements for other MOS. The UJ felt that this Crye concept uniform was most suited to the infantry soldier and designed with their specific needs in mind, although all soldier's were ultimately dependent on the combat uniform when not protected by their vehicles or aircraft. The different requirements for other MOS such as truck drivers, mentioned above, or aviators need to be accommodated in the design of the uniform or equipment platforms.

- The **stand off chassis**, which forms the core of the combat uniform, offers a number of benefits over existing systems in terms of comfort. It has an integrated cooling system a feature of the design that lifts the chassis out of direct contact with the body allowing air to circulate and cool the body and incorporates a higher load capability.

- The design of the chassis permits the individual soldier to adjust it to fit their body shape and the opportunity to change the chassis plates allows the army to accommodate the requirements of different MOS and missions using a 'standard' body chassis unit. For example, tank drivers would require a less bulky design to fit existing vehicle platforms. The UJ saw a number of benefits in terms of comfort and fit on the soldier with this ability to accommodate different body shapes and sizes. Individual fit could be achieved by altering the basic chassis and there was some discussion about the use of additional protection on exposed areas such as the lower abdomen, or when the soldier was in the prone position.

- The Crye chassis concept was seen to offer a significant improvement over the existing system (BDU, flack jackets, Molle) but it requires some refinement notably
  - The need to **replace the metal attachments** on the concept chassis due to the dangers associated with detection by the enemy due to noise, or potential injury from damaged or sheared metal attachments.
  - Address concerns over the chassis snagging in the field.
  - Further attention might be given to **neck protection** in the prone position, open side protection, and lower body protection given the length of the chassis.
  - Adjustment might be made to certain items such as the shoulder pads to accommodate shooting position

- The garment uniform was positively received and looked **comfortable**, a good fit, breathable, with wicking capabilities to provide cooling. Furthermore, it looked good on the soldier and meet expectations about appearance. Further attention might be given to comfort and fit in the prone position and the impact on the shooting position and capability of the soldier.

- This UJ felt that the concept uniform has a psychological advantage in that it makes the **soldier look larger** and more threatening, which is more **intimidating** to the enemy.

- The UJ felt that this concept would present very few problems in terms of soldier acceptability or getting used to. Most of the UJ had very positive comments about the concept uniform and wanted to try it on during the evaluation sessions to see what it felt like to wear. The UJ had no problems in donning or doffing the uniform and it was possible for the soldiers to do this themselves without assistance, despite having just been introduced to the mock up uniforms.

- The '**magmag**' concept for carrying ammunition was positively received by the UJ. Advantages of the system include ease of storage, speed of magazine deployment and the ability to carry more ammunition. There was some discussion about the size and bulk of the 'magmag', the possibility that it might restrict movement, and the durability and maintenance of the 'magmag' in the field.

- The UJ liked the idea of **disposable magazines** that took away the problem of where to store empty magazines that had been discharged.

- The integral ruck was seen as appropriate for small loads although a larger capacity ruck could be tested on the chassis for situations where a larger ruck was required. There was some discussion of the positioning of the ruck attachment on the chassis that raised the issue of ease of access and Doffing.

- The water carrying capacity should be increased with **4 litres** as a minimum requirement, or sufficient capacity for a 72-hour mission - due to problems of re-supply. Water and ammunition are two priorities for the infantry soldier.

- The **camouflage** used on the concept was very positively received by the UJ (in later discussion groups they felt this camouflage could be used on the helmets).

- There was some concern that soldiers might be overconfident about what they could achieve with this combat uniform.

### 3.2.2 Crye concept B

***'that's the first time since I been in the Army that somebody really approached this subject with an idea other than the preferred method...brand new...'***

***'..that's the ticket'***

***User Jury: Crye concepts***

This concept was basically an adaptation of Concept A for chem./bio situations.

- When using concept B one member of the UJ was able to Don the chem./bio top from the chassis **under two minutes** with no training. This ease of use was considered a major benefit over the existing chem./bio systems.

- There was some discussion over the use of the **zipper** in the chem./bio system and field durability. For some the zipper made the system overly complicated and would require training as opposed to a simple pants and top system. One suggestion was to incorporate the chem./bio top into the belt, or keep separately in the ruck for donning in a chem./bio situation.

- One UJ member proposed the introduction of **heating/cooling elements** or packs into the chem/bio suit, which could be activated depending on the climatic conditions. The disadvantage of this was the additional weight and reliance on the power source for effective heating/cooling.

- There was a suggestion that the chem/bio system should be kept as simple as possible for 'Joe'.

- The **waste management** system was seen as a real **innovation** in CBR uniform design. The UJ proposed extra waste bags, the ability to replenish bags, and the potential for inclusion in non-chem/bio combat uniforms. Although chem./bio was seen as the major application of the waste management system.

Overall the Cry concept(s) were well received. In summary

- Most of the UJ tried on the concept uniform and it received a very positive response described as a 'feel good' factor. The Crye concept both **looked intimidating and 'cool'** that the UJ felt would appeal to the young soldier and new recruits.

- UJ felt that one of the positive aspects of the concept was the ability to **accommodate technological advances** and new technology within the existing design, for example, nano-technology, lighter materials, etc.

- Besides looking cool soldiers would have to be shown the capabilities of the concept and receive training in how to effectively deploy the combat uniform.

- There were some **questions** about the **maintenance and repair** of the uniform, in particular the chassis components. Some soldiers felt that the design should consider the ease of changing or **replacing damaged parts**, as opposed to Dx-ing the whole system.

- The uniform and headgear need to be developed together as an integrated system. This was recommended by the UJ as an important consideration in the future development of the combat uniform concept.

### 3.2.3 ADL concept A

ADL concept A was a one piece uniform with integrated body armour. This was the last concept to be seen by the UJ. And there was limited discussion about this concept in the focus groups and some of the UJ saw this as the least radical departure from the existing uniform concepts.

- A number of the soldiers liked the idea of the **one piece** uniform and most of the discussion focused on this aspect of ADL concept A.

- The main advantages were
  - The integration of the body armour into the uniform offers the soldier protection all the time
  - It looked comfortable to wear
  - It is streamlined and looks good on the soldier
  - It avoids the problem of matching jacket and trousers in a conventional BDU
  - It is less problematic to issue to soldiers and easier for the Army to ship one uniform that two separate items

- Some of the **disadvantages** were
  - The **weight** of the uniform due to the incorporation of the body armour
  - The need to wear the fully protected uniform at all times even when not directly engaged in combat. With conventional uniforms and other systems jackets or chassis can be taken off when the environment is perceived to be safe.

### 3.2.4 ADL concept B

Concept B was the second uniform to be seen by the UJ (Appendix 2) and many felt that it had a number of ideas that could be fielded at present. Much of the discussion focused on specific elements of the uniform.

- The UJ liked the high degree of modularity built into concept B and the component parts allowing for the ability to match the equipment with the mission requirements. Most of the UJ felt it had potential for further development and could be fielded in the near future.

- The belt provided easy access to ammunition and equipment. This was seen as a main advantage over existing systems using ammunition pouches.

- The **body armour** provided additional **flexibility** over solid plates and if ballistically robust was seen as an improvement on existing protection.

- Attention to detail on concept B was good, for example the **innovative ammunition pouch**, although the UJ questioned the durability of the system and the need for refinement and improvement on some of the materials used in the construction. They acknowledged they were evaluating mock up concepts rather than finished products.

- While the integration of wet weather and chem/bio was seen as a good idea there was some concern over the longevity of the chem/bio protection given the dual function.

- UJ discussed **problems** of having to **decontaminate** equipment worn on top of the NBC that was not protected in a chem./bio attack and recognised the trade off between access to equipment and protection.

- Some felt that the combined wet weather chem/bio clothing looked heavy.

- There were some concerns over whether a conventional rucksack could be used with concept B.

- UJ would have preferred to see the concept in a camouflage pattern rather than black to give a better idea of what a final version might look like. The black uniforms were associated with law enforcement agencies.

- Some of the UJ felt that the amount of information available on the **body monitoring** system might lead to **sensory overload** and interfere with the soldier's own senses and awareness of their physiological state. The advantage was the ability of the monitoring equipment to detect under performance or anticipate problems such as dehydration in advance of their onset.

### 3.2.5 ADL concept C

> ***The C-uniform was. I mean, I expected to see something like that where, you know, right out of Hollywood. I figured, you know, some guy would walk out looking a storm-ship trooper and we'd have all these, you know, just touch the kneepad, and this and that happens. But I, you know, everyone of those uniforms I look at yesterday, in a cold-weather climate, I'd probably have no problem in. But being in Fort Campbell in the summer, I wouldn't put that stuff on 'cause it's too hot. And I think we're relying on that, that cooling system had better be what it's touted to be because otherwise that stuff's going to come off in a hurry. People are going go right back to where they're at because you can't tote that kind of stuff around and be in those variations of uniforms very long. And you know the, the temperature setting that you guys are working with, I know as a fact, right now, I've got some friends over in Afghanistan. And they're, you know, there are areas over there, they're in the 100s already. And wearing the flack vest and everything else you've got, it's just going to be too hot. So that cooling system's got to, got to work well'.***
>
> ***User Jury: ADL concepts***

This was the first concept presented to the UJ by ADL. It was based around a carapace system with components built onto and into the uniform. Much of the focus group discussion centred on concept C and the components of the system.

- UJ were **impressed with the individual monitoring** system that allowed the soldier, and officers, to monitor physiological status thus maximising performance and protecting the individual from dehydration, overheating, etc.

- UJ felt that the **carapace weight distribution has potential** for further development. They felt that the carapace looked robust but the hydraulics mechanism would need to be protected tested for durability in the field. There was some discussion about potential problems arising from **damage** to the **hydraulics** system and the issue of maintenance and upkeep during a mission.

- Most of the UJ thought the carapace system looked heavy; to be effective it should be lighter.

- There was general feeling that soldiers would have to learn how to use concept C and special training would be required.

- This concept was **overcomplicated** for some of the UJ – '***too much shit***'.

- There was some discussion about the comfort and mobility of the uniform when in prone position. This was discussed with the soldier modelling the concept uniform.

- UJ liked the idea of the belt providing easy **access to ammunition** and equipment and the fact that they could jettison the belt if required.

- There were some questions over the use of multiple power sources with this concept. The integration of flat pack batteries offers more flexibility over existing power sources where bulk and weight are major constraints but there was still some concern over problems related to power failure and the trade off between weight and power supply.

- UJ liked the idea of a **cooling vest** but there were some concerns over the implications of **malfunction** and awareness that it was very much at the conceptual stage. The mock up system was considered too noisy for use in a combat situation where it might alert the enemy to the soldier's position.

- **Hand and leg warmers**, integrated kneepads and thigh protection were **well received** by the UJ adding to soldier comfort and protection. These ideas might be incorporated into contemporary uniform design.

- UJ felt that the **water filtration system** was an excellent idea and there was some discussion over the merits of a disposable filter over a reusable filter. UJ liked certain features such as the ease and speed of refilling the water containers.

- When asked who might use this combat uniform the UJ felt that it would **not** necessarily go to **all soldiers** but might be used on certain missions or issued to special forces.

- There was sense that this concept would present a **logistical challenge** to the military in terms of **issue and maintenance**.

> ***'this thing has to be a day-to-day useable, easy to come out and use and train with and everything, else, if this thing is going to get locked up in a unit supply and it's issued in time of war, okay we are going out to Brigade Ft X come in and issue out X number of things – this thing has to be down at Joe's level, everyday, for him to try on, or him to modify, ... and the other thing is a lot of this is nice, ..but if Joe can't modify it to suit his needs it's worthless to him'***
>
> ***User Jury:ADL concepts***

There were a number of positive elements contained within the ADL concepts. In summary

- The UJ felt that concept C was closest to the brief in terms of their expectations prior to attending the assessment.

- There was a general feeling that many of the ideas presented utilised **'off-the-shelf' technology as opposed to future concepts, state of the art, or 'out of the box'** ideas. However, a number of key features were endorsed in the discussion by the UJ
  - Soldier monitoring system (concept C)
  - Carapace weight distribution management (concept C)
  - Flat batteries (concept C)
  - Water filtration system (concept C)
  - Cooling vest (concept C)
  - Body armour (concept B)
  - Body belt (concept B)
  - One piece uniform (concept A)

- The UJ response was to ask the question **'so what'** in relation to the concepts and ideas presented, reflecting the basic concern with overall effect on soldier performance. Much of the technology was attractive but not all the UJ were convinced that it offered any significant advantages to the performance of the infantry soldier.

- Most of the concepts presented were considered to be 'too hot' to wear and while cooling systems were incorporated there was some concern over system malfunction, or loss of battery power.

- The UJ raised questions about the ease of Don/Doff for concepts A and C. When presented with the opportunity to try on or view the concepts some of the UJ donned the concept B body armour. Some soldiers felt that **two people were required to Don/Doff concepts A and C.**

## 3.3 User jury perspectives on IPA headgear concepts

> ***'And let's go back, another thing we talked about yesterday day, is we talked about maintenance. This is all great and fine. Now something happens to it, it breaks, something doesn't work – you know, taking these – like I like the idea of these coming off, because hey, it goes bad, I pull it off, I turn it, I get another one. I clip it on, I screw it on, I'm good to go. The GPS goes out, I take it down to DS or I can, hey, unscrew it, pull it off, put it on, screw it back in, we're good to go. The ease of change –'***
>
> ***User Jury: Crye concepts helmets***

The evaluation of the headgear concepts differed in the sense that both UJ' groups saw the same headgear concepts. Exponent presented three headgear concepts, R1, R2, and R3. Once again the UJ had an opportunity to try on the headgear, use some of the features and equipment that was incorporated into the headgear design and speak to the contractors and developers about the concepts presented. The group discussions followed the contractor presentations and interaction with the concept products. The UJ want lighter helmets offering good ballistic protection as part of the Scorpion program.

- The future for helmets lies in smaller, lighter, helmets with better ballistic protection.

- Overall the UJ liked the **modularity** built into the designs and the ability to tailor the equipment on the helmet to the mission.

- Concepts R1 and R2 were seen as an improvement on the existing system (most of the UJ had Kevlar helmets or K-Pot with several using the Mich). The second user group saw **little benefit in the R1 over the Mich** and felt that resources should be devoted to the R2, fielding the Mich in the interim. The R2 was the preferred helmet in both UJ groups.

- For most of the UJ the **R3 was too 'visionary'** and seemed to offer no significant advantage over the R2. The **problems** with **R3** related to the **fit** of the helmet, the **visor breaking, or steaming up, and the durability** of the product in the field. There was some concern over what would happen if the R3 malfunctioned in the field. In contrast the R1 and R2 were more like a regular helmet as on UJ member explained his preference for the R1/R2

**. I mean, if that stuff fails, then you can go back to what you know and trust – my own ears, my own eyes, and you can deal with it. And like he said, that's functional. You pull everything off and you have a regular helmet.**

**ADL User Jury - Helmets**

- UJ recognised the potential chem/bio application and added ballistic protection for the **R3** but felt the design was not appropriate. This item was **awarded the 'Bullshit' flag** in the second UJ group although they saw some merits in the helmet and the possibility to develop the head up display in R3 for the R2 mandible.

- The use of cooling/gel liners in the helmets was seen as a positive development in terms of comfort.

- The **integration of equipment into the body of the helmet** and the modularisation (R2 and R3) are seen as major advances in helmet design although this has weight implications.

- The **information management systems were very positively received** although

  - The UJ expressed a need for appropriate information not simply more information and the ability to retain their own 'sensory' attachment in the field via their natural senses.
  - The UJ preferred the 'monocle' display (R2) to the head up display (R3) for information.
  - There was some discussion of the benefits of mono-chrome versus colour displays and the UJ anticipated special consideration needs to be give to spectacle wearers.
  - There is a need for selective monitoring of communication and individual physiological status information throughout the unit with different access levels.
  - Different MOS will have different information requirements and this should be considered.
  - Attachments should be fixed to reduce the possibility of losing the equipment, but be removable so helmets can be configured according to the MOS, or the mission ('easy-on-easy-off', or 'plug and play' systems).
  - Among the components mentioned the **3D audio feature was viewed as providing a major advantage** to the soldier.
  - The body monitoring sensors in the helmet are a good idea additional throat and chest sensors might be linked into the helmet system.
  - All of this equipment needs to be protected in the filed from ballistics, impact damage, scratching, wear and tear, etc.

- Helmet and uniform information systems should be integrated, for example using both head up display and uniform display.

## 3.4 Improvements and refinements to the IPA concepts

***'I think the stuff here already is probably much better than what we're using. Even if you were to give it to us right now, I bet it would be much better than what we're already using. But since it's for the future, I think, you know, we're doing the right thing by trying to nail down the things, the little things that are going to probably cause trouble. I think right now everything in here is much better than what we got'.***

***User Jury: Crye concepts***

In the process of the discussions the UJ made a number of valuable suggestions for improvement and refinement of the new uniform concepts presented too them. This section reports on those suggestions that emanated from the focus group discussions although there were a number of other suggestions in the UJ questionnaires.

### 3.4.1 Neck down concepts

The refinements very much depend on which concept is adopted and which elements are incorporated into the final design. However the group raised some general issues and identified a number of areas where further refinement is required. These are listed below.

- The final uniform will have to pay attention to the **materials** used in the construction for durability in the field and protection of the soldier, for example, avoiding metal attachments, or the risk of snagging on parts of the uniform or chassis/carapace. Materials need to be evaluated for cut, slash, and puncture protection.

- Further attention should be paid to **protecting** the soldier in different positions, for example, neck and chest protection in the prone position. Clearly there is a trade off between protection, weight and flexibility and much depends on developments and improvements in materials.

- The soft body armour has potential for development as long as weight is not traded for ballistic protection.

- Careful attention should be given to the bulkiness and **positioning** of equipment, for example ammunition pouches, monitoring equipment, battery packs etc. This is particularly relevant in terms of mobility and comfort, as well as addressing concerns about optimal positioning of equipment and snagging/damage problems.

- The chem./bio systems require further refinement and testing for **durability**, ease of don and doff, and decontamination.

- Power systems have to be tested for durability, **reliability, and maintenance** and further efforts made to reduce the weight.

- New combat uniforms have to be able to accommodate and incorporate new technology and materials as they become available, for example improvements in battery technology, new protective materials.

- Further consideration should be given to maintenance and repair issues in the field. Particularly in the case of central components such as combat uniforms based on a central chassis or carapace. The UJ questioned the durability of these designs in field conditions and the problems of having to repair or maintain the systems under combat conditions. This is best illustrated in one quote from the UJ commenting on ADL concept C

> ***To go on what he said, and I think this is one key that a lot of people haven't thought out, look at the maintenance that's going to be involved in this stuff. I mean, this is not a simple uniform. You're talking a PCI has just gone, you know, 45 minutes longer 'cause you got to do a bunch of check on your computer system. You've got to make sure that your cooling system's working right. You've got to make sure that your, your hydraulics are, you know, left, right, and front, and back and everything else. There's, and the maintenance aspect alone of this thing, coming out of combat or going in prior to is, it' going to be enormous. I mean, it's not going to be a simple process. You've got enough stuff to think of prior to going into a combat situation. That now you're going to be doing systems checks and, you know, everything else on this. Plus, getting it back out of the box, when you're done and you're fighting and everything else, then you've got to go back and you recover and stuff like this. Okay, We've got to check your components. Run an electric check on, you know, plug the batteries into everything, make sure, it's going to be a lot of high maintenance stuff. And I'm not sure that durability-wise, this stuff is going to last over a year, year and a half.***
>
> ***User Jury:ADL concepts***

### 3.4.2 Headgear concepts

The comments relating to headgear are much more specific, mainly because there was an early consensus in the UJ groups that R2 was the preferred option for further development.

- One of the main considerations with the concept helmets was the ease of Donning and Doffing.

- There was some discussion of the earpieces in R2 and whether they were restrictive and comfortable with prolonged wear. Overall the **earpieces** in this helmet were **well received** permitting ear protection and the ability for the soldier to remove the earpieces as required to restore normal sensory facilities.

- The UJ was **split** on a preferred method of **chin strap**, the chin cup was regarded as more reliable especially in airborne situations but more cumbersome, for others the chinstrap offered a simple and convenient option but there were some concerns about airborne operations and the comfort of this system. It was agreed that the chinstrap required further development in relation to getting a comfortable fit and ease of and don/doff.

- There was some discussion of the **need for neck protection on R1 and R2** helmets.

- One UJ **liked** the idea of an **integrated visor (R1 and R2)** but felt that it should be cheap and **disposable** due to the problems with scratching and damaging the visor in the field. The other UJ rejected the idea and felt that unless it could incorporate information on an up-front display similar to the R3 that it served no purpose and standard goggles or glasses would protect the soldier against dust, grit, missiles, sun etc.

- The second UJ felt that a retractable monocle or visor on the R2 could be developed to incorporate the same display technology in the R3. This would avoid what they saw as problems with damage to the display stem in the field, or prevent soldiers picking the helmet up by the display unit arm.

- There was some concern over the **helmet-uniform interface** and the types of connectors used in linking the helmet systems to the power source. The UJ felt that these helmet cables could snag, get disconnected, or damaged in use thus creating problems with the helmet systems that relied on power sources within the uniform. The general preference was for wireless communication, although the UJ recognised this has power implications.

- The UJ felt that further consideration should be given to **back up power sources** either in the helmet or uniform in the even of power failure or damage, with the potential for additional 'carry on' power sources.

- There was some discussion about the need to camouflage helmets according to the combat terrain and one group proposed camouflage paint that could be applied for different operations, or using the camouflage used on the Crye uniforms.

- All helmets require some form of 'id' display on the front and back of the helmet for individual identification in the field.

- The **hands free operation of a helmet light** was seen to outweigh the signature potential. Accidental activation of the light in the field should be prevented. There is a requirement for both day and night lights.

- The **'high tech' nature** of the R2 and R3 has **implications for soldier training** and raises questions about helmet issue and who takes responsibility for maintenance and repair of the components

### 3.4.3 Chem./bio helmet protection

- The UJ **liked** the idea of the **mandible attachment on the R2** but expressed some concern about the **fitting of the mandible** in a chem./bio environment or an emergency. There was some concern over the ease of deployment and fitting of the mandible. Some preferred the **mask on R1** for ease but most agreed that the **concept was sound but required further development**. Specific areas for attention were fit of the mandible to the helmet and the face and the need to develop masks for specific MOS, for example, tank drivers have very different requirements to infantrymen.

- The UJ made a clear distinction between the need for face protection in a non-chemical environment, for example in crowd control or snatch situations, and the need for protection in a chem../bio situation. They proposed different mandibles for each situation.

- The R3, offered best chem../bio protection with the possibility for completely sealing the individual against chem./bio attack. Possible use by 'chemdogs'.

## 3.5 Potential challenges regarding user acceptability

The main resistance to change is likely to come from those who have been in military service longest and UJ felt that First Sergeant Majors and Majors would need to be convinced of the benefits of adopting a new system to guarantee successful introduction. There is some anecdotal evidence of institutional resistance to the idea of a new combat uniform and this represents one of the major challenges to the programme. The UJ were very receptive to the idea of a combat uniform, and interested in many of the concepts and ideas presented by the contractors. They felt that 'Joe' would provide the ultimate test for the concept and user acceptability would depend on the demonstrable benefit to soldier performance, and mission success. If the new combat uniform was shown to improve performance and was supported by key groups such as senior ranking officers and Special Forces groups it could be successfully adopted across the Army.

The institutional resistance to change was recognised as a major barrier to the success of the programme, and some of the UJ did not want to see this emerge as another 'Land Warrior', where promises were made but the programme was perceived as being slow to deliver.

As stated, there was a positive response to the idea of developing a special uniform, appropriately designed for combat situations and specific missions. Priorities centred on the ability of the new uniform, materials, design and equipment, to enhance soldier performance and improve the chance of survival in the field. This ranged from using lighter materials, better ballistics and protection on clothing and headgear, through to the use of new technology such as soldier monitoring and information support systems to assist the soldier in the field. However, most of the UJ were adamant that this had to be tested and proven in the field before soldiers would have confidence in using it. The concepts were good but the ultimate test lay in the final product. Existing systems are not perfect but they have been tested in the field and soldiers are aware of the limitations of their existing equipment.

## 3.6 Key benefits and implications for military personnel

***'What I like sir..is this system you guys got..the whole system you guys got where you got us here, talking about it – that's the smartest thing the army and, or whoever is running of this thing, ..smartest thing cause right now you're working the bugs out before they become big, I think that's the best thing you guys are doing with this whole thing, you guys have got the brains and the gee whizz stuff to fix it, you gotta get us people and soldiers out here, what you doin, see what's gonna work'***

***User Jury: Crye concepts***

As the above quote shows there was a consensus that a combat uniform was a future requirement for the military and user involvement was central to the success of the programme. Key benefits that emerge from the analysis relate to

- The development of a specific uniform for combat situations that allow the soldier to tailor the uniform and equipment to the requirements of the mission. Thus reducing weight without any loss of protection and improving the performance and survivability for the soldier. The key benefit remains improving the soldier's performance by providing a uniform designed specifically for combat.

- The incorporation of new equipment and technology to support the soldier in the field and provide information central to the success of the mission. However, the equipment and technology has to be reliable and robust and any improvement has to show a demonstrable benefit to the soldier's performance. In evaluating individual components the UJ asked 'so what' will specific equipment or technology mean in terms of soldier's performance and survivability.

- The improve in overall performance of the soldier by directly addressing the combat soldiers needs and recognising the different MOS requirements.

### 3.6.1 Introducing the new uniform

***The whole thing is change. I've been doing it for thirty years like this; I'm used to this; don't change. Even if it's better. The first, the resistance will be because it's a change. Even if it's better, you have to sell and show them, like they're saying, the – see the, so what – look what it does for you – and it will be a sell. But at first there's going to be resistance with these old people because it's change and they've done it the same way for thirty years.***

***User Jury: (AD group ) helmets***

The new uniform needs to be integrated into the existing system but the UJ was split between gradual introduction and fielding of the concepts initially to Special Forces and new recruits (in order to overcome cultural resistance to change) and the more radical idea of introducing the complete system throughout the Army (in order to avoid a piecemeal approach). There was a sense that the combat uniform could be introduced in basic training when new recruits are first issued with clothing and equipment and combined with a training programme designed to instructing soldiers on how to use the new equipment when they joined up. The UJ felt that the introduction of a new uniform could have a positive effect on recruitment and be 'flattering' to new recruits.

The Scorpion system should be tested in the field, particularly at NTC and JRTC. Marines, 101, 82nd Airborne, and West Point officers could be enlisted to promote the concept. Testing out prototypes under field conditions will provide valuable data on the concepts as well as examining the response of users to the new combat uniform. The UJ felt that 'Joe' would provide the ultimate test of the uniform in the field but acceptance by the current Army also depended on gaining widespread backing and support from Officers.

While the basic uniform concepts were good, and individual elements of the systems were considered feasible, the final concept has to be promoted and delivered on time to instil confidence in the user that the Scorpion programme could deliver what it promised. In this organisation, the Army, resistant to change this was seen as a major challenge in gaining acceptability of the new combat uniform. The timing of the introduction would be a key element in the success of the programme and central to ensuring that it delivered what it promised in terms of performance.

The new uniform was seen as progressive and proactive on the part of the Army and something that offered practical benefits to the soldier.

*A: But if you asked the people it's meant for, if I was upper-ranking, a general or maybe even a colonel or something, I would want that. If you came to me right now, I would look at, see – I'd kind of cut through the Hollywood image of it, and I'd see what was practical, and the so-what issues and all that – I would probably say, I want that right now. Not because it looks sexy or anything; maybe it does.*

*But I'm not going to not want it because of that. I'm going to want that stuff. If you came to me with that, the R2 helmet and the other outfit (Crye concept) perhaps, something like that, I'd probably want that right now today. Because it's usable. And it's totally functional. It's not too much advanced. Totally acceptable. I would want that –*

*A: – because it's better for my soldiers, for all the reasons we listed on the questionnaires – increased lethality, it's modernized, it's up-to-date, we need this stuff –*

*A: Comfort.*

*A: – comfort. It's all practical things. It wasn't really on there. They asked us about that – what would you pitch off here, what would you not want on it, what's not practical? Not too much stuff.*

*A: I would really, I would tone down the image pitch. You know, when we first started here, you guys were all gung-ho about the shock effect or the Hollywood image. I would downplay that totally. You just – form following function.*

*User Jury: (ADL group) helmets*

# CHAPTER 4: CONCLUSIONS

This research offers a 'user' perspective on Phase 1 combat uniform design and grounds the concept evaluation in the combat experience of the soldier. The User Jury (UJ) were presented with, and evaluated, a total of five combat uniform concepts and three helmet concepts. In a series of focus groups, following the presentations from contractors, the User Jury discussed the concepts in general and commented on individual elements within each of the presentations. This detailed feedback provides guidance on the feasibility of the ideas presented by the contractors and critical and constructive comment on what the soldiers believe is feasible in terms of further development.

End users have a valuable contribution to make to the Scorpion IPA programme, and the development of a new combat uniform. What was apparent from the groups was the breadth of experience within the UJ, and the range of views and opinions from the different MOS. Infantry soldiers, tank crews, engineers, transport operators, medics, and aviators all have different needs, uniform requirements and constraints and a new combat uniform should accommodate these. One approach is to develop a standard uniform that can be adapted to fit existing platforms to ensure that, for example aviators, tank crew, or transport drivers can use the combat uniforms in their vehicles or aircraft. In this case the combat uniform needs to be developed around existing platforms and tailored towards the specific needs of each MOS. Alternatively, this programme takes a soldier –centric approach whereby a new platforms might be developed around a standardised combat uniform . This was seen as more appropriate and firmly locates the soldier at the centre of the development process.

In addition, the combat uniform has to be operable in a range of different combat environments and should be adaptable to meet the needs of each mission. This ability to customise the uniform to the MOS and the mission was considered an important aspect of the design. Further consideration might be given to the type of combative situations envisaged in the future, for example urban environments, or desert conditions. The UJ discussed the usual problems of designing the uniform to fit a variety of body shapes and sizes and thought that the use of an adjustable chassis that can be 'fitted' to the soldier was a good idea. Despite working with mock up uniforms and concepts this was seen as an important stage in the development process to consider uniform fit, comfort and, related to this, mobility. Specific concerns were raised about the weight and durability of some of the concept clothing and equipment. Much of the discussion centred on this issue of incorporating sufficient flexibility in the design to allow the combat uniform to be adapted and tailored for application and use in a variety of situations. The combat uniform should allow for interchangeable components, equipment, and camouflage that are compatible with the demands of the mission and a modular design permits the soldier to tailor the uniform to the mission. This was seen as an important consideration and driven by the experience of the UJ who acknowledged the trade off for the infantry soldier was between ensuring they were adequately equipped for the mission and avoiding carrying too much weight. Ammunition and

water are regarded as central concerns in this respect and much depends on the length of the mission and anticipated re-supply times. Ultimately for the UJ it came back to the question of what the combat uniform could do to enhance the performance and effectiveness of the soldier in the field.

While the focus groups gave an indication of the overall preferences of the UJ, certain elements from each of the concepts were considered viable, for example, the water filtration system, the idea of a cooling system, the knee pads, and so on. A number of the ideas presented to the UJ could be developed and with further adaptation and refinement be incorporated into the next development phase. The evaluation is clearly limited in the sense that soldiers are only exposed to concepts and mock up uniforms as opposed to finished products but the development and testing of prototype combat uniforms has provided useful data on how the development might proceed. This report has highlighted the key elements and some of the potential problems with these Phase 1 concepts.

Among these it highlights the challenges of introducing a new uniform concept into the military, and some of the difficulties in gaining acceptance for a new combat uniform. This should not be underestimated and represents a major challenge to the success of the Scorpion IPA system. It is important to acknowledge these barriers. The UJ was drawn from serving officers and they felt that to ensure success the concept uniforms should be tested with regular soldiers in the field to see 'what works on the ground'. It is clear, however, that the success of the uniform depends on enlisting support across the military, and in particular ensuring that Sergeant Majors and Majors are behind the introduction of this concept. This will entail building a strong case for the combat uniform and ensuring that the features are clearly detailed, and importantly the benefits identified and quantified in terms of individual performance. In terms of the technological innovations these need to prove reliable and durable in the field, the UJ recognised the benefits of the monitoring and location devices for example, but acknowledged the potential problems with malfunction or damage to these systems. There was a sense that over-reliance on the technology was not in itself a good thing and this will involve convincing the soldier of the benefits. Engaging with the technology in the presentations the UJ saw the potential in its application. It was suggested that younger soldiers and new recruits may be more receptive to this use of technology and more willing and able to use it, especially if it is introduced when they enlist. This raises further challenges in gaining acceptability of the new combat uniform concept, and associated technology, within the US Army. Furthermore, the success of this project also depends on delivering on time and meeting promises and expectations within the projected timeframe.

Training was seen as an essential part of the introduction of the combat uniform and the UJ felt it should form an integral part of the program. The potential benefits of the new combat uniform rely on the soldier being proficient in the use of the uniform and properly trained in its effective deployment. One solution is to introduce the uniform to new recruits and ensuring adequate training is provided from the start. The introduction across the rest of the Army is likely to prove more challenging and meet more resistance but adequate training provides an opportunity to illustrate the benefits of the combat uniform. Another important issue relates to the upkeep and maintenance of the combat uniform and this should also form part of the instruction on how to use the uniform. At

this stage it is not clear how the combat uniform would be issued but the UJ felt that ideally every soldier had the right to this uniform. This operational and logistics element requires further consideration.

While the acceptance of the combat uniform concept is clearly related to functional qualities and performance benefits the UJ recognised the need for uniforms to look good and intimidate the enemy. This idea of a dedicated combat uniform is, for some, a radical departure from the current BDU, yet it acknowledges the importance of the soldier and a willingness to build systems around the soldier rather than fit the soldier into various platforms. In this respect the programme symbolises the principal role of the solider in combat and the need to see the 'soldier as a system'. The commitment to develop a new combat uniform, and the decision to engage soldiers in the development phase is seen as a very positive step and one that while not characteristic of the institution was welcomed by those on the User Jury.

This stage of the programme is centred on concepts and the UJ were exposed to mock up uniforms and prototypes, ultimately these ideas need to be taken through to the next stage and the concepts tested in the field.

# Appendices

## Appendix 1: Crye concept A

http://www.natick.army.mil:80/warrior/02/septoct/untangle.htm

## Appendix 2: ADL concept B

**Source Scorpion Project Management Team, Natick**